

BIBLIOGRAPHICAL NOTICE.

Flora Belfastiensis. The Plants round Belfast; with their Geographical and Geological Distribution. By RALPH TATE, F.G.S. 24mo. Belfast: G. Phillips & Sons. 1863.

THIS little book is well suited for the object contemplated by its author, viz. to be an assistance to the amateur botanists of Belfast. We are glad to learn by its publication that that is a numerous class there.

The district is interesting, and is shown by this list to be rich in plants. The number of geological formations is large, and the range in height extends from the level of the sea to the top of Black Mountain, at an elevation of 1272 feet. Excluding such plants as have small claim to be regarded as native, this little Flora records 602 species within a circle of from ten to fifteen miles' radius from Belfast. It is probable that its publication will cause some increase in that number, but we may doubt if it admits of much extension; for the author and his friends have apparently searched the country with acute and discriminating eyes. We should like to know what their *Papaver dubium*, *Viola canina*, and *Arenaria serpyllifolia* really are.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Nov. 10, 1863.—E. W. H. Holdsworth, Esq., F.Z.S., in the Chair.

NOTES ON THE SEBASTOID FISHES OCCURRING ON THE COAST OF CALIFORNIA, U. S. A. BY WM. O. AYRES, M.D., C.M.Z.S.

A remarkable feature in the ichthyic fauna of the coast of California is the occurrence of a large number of species belonging to the old genus *Sebastes*. They are taken in great quantities, and, being all of excellent quality for the table, they furnish a large proportion of the fresh fish sold in the markets of San Francisco. The different forms are readily distinguished by the fishmongers, though they sell them all under the absurd name of "Rock Cod." Their ichthyological history may be thus recorded.

In August 1854, *Sebastes auriculatus*, Girard, *S. rosaceus*, Gir., and *S. fasciatus*, Gir., were published in the 'Proceedings of the Academy of Natural Sciences of Philadelphia.' A few weeks later (in September), before the Philadelphia publication reached California, *S. nebulosus*, Ayres, *S. paucispinis*, Ayres, *S. ruber*, Ayres, and *S. ruber*, var. *parvus*, Ayres, were named in the 'Proceedings of the California Academy of Natural Sciences;' and in the same paper I indicated another species as perhaps *S. variabilis*, Cuv. Of these, *S. nebulosus* is identical with *S. fasciatus*, Gir. (but as the name *fasciatus* had been preoccupied by Dr. Storer for a species of Massachusetts Bay, *nebulosus* must be retained for the Californian species); *S. ruber*, var. *parvus*, is *S. auriculatus*, Gir. In November 1854, S.

nebulosus, *S. paucispinis*, *S. ruber*, and *S. variabilis* were mentioned again by me in the 'Proceedings of the Boston Society of Natural History.' In 1856 the species referred to by me under Cuvier's name *variabilis* was described by Girard as *S. melanops* (Proc. Acad. Nat. Sci. Phil. viii. p. 135). In 1858, in the tenth volume of the 'Pacific Railroad Reports,' Girard described all the species as he then understood them, giving my *S. ruber* as a synonym of his *S. rosaceus*,—an error on his part, since the two species are entirely distinct. In October 1859, *S. nigrocinctus*, *S. helvomaculatus*, and *S. elongatus* were described by me in the 'Proceedings of the California Academy of Natural Sciences.' Of these, *S. helvomaculatus* is considered by Mr. Theodore Gill (Proc. Acad. Nat. Sci. Phil., June 1862) as merely a synonym of *S. ocellatus*, Cuv. In 1861, Mr. Gill (Proc. Acad. Nat. Sci. Phil., July 1861) proposed to separate *Sebastes paucispinis* from the other species, under a new generic name, *Sebastodes*. In 1862 (Proc. Acad. Nat. Sci. Phil., June 1862) the same author proposed to include all the other Californian species in a new genus, to be designated *Sebastichthys*. In January 1863 (Proc. Cal. Acad. Nat. Sci. ii. p. 209) I described two new species, *Sebastodes flavidus* and *S. ovalis*. At the same date (*op. cit.* p. 211) I gave a brief sketch of what I believed to be the correct synonymy of the species now known on the coast of California.

Such has been, in brief, the series of notices and publications relating to these fishes. We have thus eleven species, all of which were (or would have been) until recently designated as *Sebastes*. A careful investigation of them all, with examination of very numerous specimens, has, however, convinced me that they must be arranged in two generic groups; and inasmuch as two generic names have, as above stated, been proposed for them by Mr. Gill, it is well to consider whether these names truly represent the two groups as seen in nature.

Of *Sebastodes* he gives the following diagnosis:—"This genus is framed for the *Sebastes paucispinis* of Ayres. It has a very different facies from *Sebastes*, and is readily distinguished by the longer body, the very protuberant lower jaw (which has a symphysial swelling beneath), the minute scales, the form and armature of the head, the deep emargination of the dorsal fin, and the emarginated caudal." Such a grouping of characters as this belongs only to the single species, *S. paucispinis*. In the ratio of depth to length we have every step, from the "longer body" of *S. paucispinis* and *S. elongatus* (which two are of about equal slenderness, though in other respects they differ widely) to *S. ovalis* and *S. nigrocinctus*. And I may here take occasion to remark that the practice, in describing fishes, of giving the ratio of depth to length with such minuteness as is the custom of some writers, has no warrant in nature, since different individuals of the same species vary widely in their relative depth; and not only so, but the same individual varies widely at different times, according to the abundance or scarcity of food, and from other causes. The "emargination of the dorsal fin" is most decided in *S. flavidus*, while the least emargination of all occurs in *S. elongatus*, and the next to that is in *S. ovalis*, which latter, however, is most closely allied to

S. flavidus. The "emarginated caudal" is a feature so slightly marked at the best, and disappears so gradually from one species to another, as to be of very little value. It is greatest in *S. paucispinis* and *S. elongatus*, and becomes less through *S. ovalis*, *S. flavidus*, *S. melanops*, *S. rosaceus*, and *S. helvomaculatus*; in *S. ruber* and *S. auriculatus* the fin is about even, and in *S. nebulosus* and *S. nigrocinctus* it is slightly rounded. The "protuberant lower jaw" and its "symphyseal swelling beneath" are of greater value as generic features; they are common to five of our species. These five have the lower jaw (which is knobbed at its extremity) continuing nearly the line of extension of the top of the head; in these five the top of the head is smooth and unarmed. In the remaining six species the two jaws are but little unequal, and the lower is blunt and does not continue the line of extension of the top of the head; in these six the top of the head is strongly ridged and spinous. But when we look at the species of other waters, we find that the relative development of the jaws can scarcely hold such rank as our groups here would seem to indicate. *Sebastes viviparus*, for instance, with the surface of the head very rough and spinous, has the knobbed projection of the lower jaw strikingly developed. The "minute scales" belong only to *S. paucispinis*. It does not seem possible, therefore, that *Sebastes* can be retained with such limits as were assigned to it by Mr. Gill.

Let us now turn to his definition of *Sebastichthys*. He assigns as its characters "eleven to twelve (XI. + I.—XII. + I.) spines in the first dorsal fin, palatine teeth, and the physiognomy of *Sebastes (norvegicus)*." But all of our species, *S. paucispinis* included, have the same number of spines in the first dorsal fin—thirteen, or, if a division is preferred, XII. + I.; and all are furnished with teeth on the palatines. Neither can the "physiognomy" be deemed of value, inasmuch as forms so very unlike are here gathered into one group: the rough, blunt-headed *S. nigrocinctus* has little kindred in features to the smooth, sharp-nosed *S. melanops*. And as *S. norvegicus* itself is provided with palatine teeth, the only character remaining to separate *Sebastichthys* is the number of first dorsal spines. This, unsupported, does not appear sufficient.

The divisions of our Californian species, therefore, which have been proposed by Mr. Gill I cannot adopt, though one of his names may be retained with a different limitation.

Of the two groups which, as before stated, I find to exist in our waters, one has the top of the head rough, the other has it smooth. The former I refer without hesitation to the genus of which the common species of Massachusetts Bay, *S. viviparus*, is a member; and, since Cuvier in his original diagnosis separates *Sebastes* from *Scorpena* in consequence of the absence of fleshy filaments on the head, it seems most natural in making a division of his genus that the name *Sebastes* should be retained for those which, like *Scorpena*, have the top of the head rough with ridges; and I propose thus to restrict it. For the other group (those with the head smooth) a distinct generic name is needed; and since the appellation *Sebastes*

has been proposed for one of the well-marked species, it seems better to apply that to the entire group than to introduce a new term. I suggest, therefore, the following arrangement:—

Gen. SEBASTES.—*With the characters of Sebastes as given by Cuvier, except that the top of the head is always marked by spinous ridges, the orbits being commonly crested, so as to leave a depression between them.*

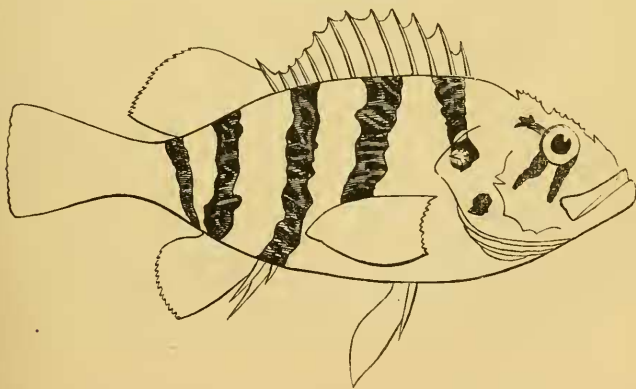
Gen. SEBASTODES.—*With the characters of the typical Sebastes, except that the top of the head is always smooth, the spinous ridges being so little developed as to be barely discernible, the orbits not elevated.*

In what manner the species of other waters should be distributed under this division I do not purpose at present to specify. The means of reference to original authorities are here, unfortunately, so small as to make the attempt useless. The Californian species, however, hitherto discovered may be arranged and designated thus:—

1. SEBASTES NIGROCINCTUS, Ayres, Proc. Cal. Acad. Nat. Sci. ii. p. 25, and p. 217, fig. 67.

Sebastichthys nigrocinctus, Gill, Proc. Phil. Acad. Nat. Sci. 1862, p. 278.

This is more strongly marked in the generic features than any other of our species. The spines of the top of the head are very prominent; the nasal spines strong, while nearly continuous from them are a pair of slender interorbital ridges; the supraorbital crest



sometimes a single ridge, and sometimes a series of spines or tubercles; posterior to these a row of blunt tubercles, extending across the top of the head, varying in number from two to five or six; posterior to these the occipital ridges, very high, and commonly not terminating in a spine. The posterior suborbital terminates in a distinct spine. The preopercular spines are less prominent than in most of the species, consisting of two, or at most three, on the posterior border, with one or two rounded but not spinous projections

beneath. The humeral suprascapular and two opercular spines are of moderate development. The spinous and soft dorsals are about equal in height, the spinous rays quite stout. The second anal spine is higher and stronger than the third.

The colours in this species are entirely characteristic, and very strongly marked. The fish is of a plain reddish yellow, crossed by five to six very distinct, nearly vertical, broad, dark bands, with commonly two or three similar bands from the eye, one upward and backward, and the others downward and backward. These bands in my original description were said to be black, and the specific name was given with that understanding. But I have since that time seen specimens in which the bands were of a dark reddish brown when fresh from the water, and became black only on the drying of the surface or on immersion in alcohol.

S. nigrocinctus is not at all common in our waters, many months often passing without a specimen being taken. It seldom exceeds two pounds in weight.

2. *SEBASTES NEBULOSUS*, Ayres, Proc. Cal. Acad. Nat. Sci. i. p. 5.

S. fasciatus, Gir. Proc. Phil. Acad. Nat. Sci. 1854, p. 146, and P. R. Rep. x. p. 79, pl. 22 (non *S. fasciatus*, Storer, Proc. Bost. Soc. Nat. Hist. v. p. 31).

Sebastichthys nebulosus, Gill, Proc. Phil. Acad. Nat. Sci. 1862, p. 278.

In this species the spines of the top of the head are less prominent than in *S. nigrocinctus*. The nasal and anterior supraorbital are sharp, rather strong; the posterior supraorbital a smooth prominent ridge, ending in a strong spine; the intraorbital space smooth, not ridged as in *S. nigrocinctus*; postorbital spine sharp and strong; occipital spine a long smooth ridge, prominent, but not near so high as in *S. nigrocinctus*, and ending in a sharp spine; no spines on the suborbitals; humeral, scapular, and opercular spines flat, and not prominent; preopercular five, well developed, rather sharp, the two on the lower border more blunted. Spinous dorsal much higher than the soft; second anal spine higher and stouter than the third.

The colours are sufficiently well stated by Girard (*loc. cit.*). *S. nebulosus* is by no means rare, and is found in the markets of San Francisco at all seasons, seldom exceeding two pounds in weight.

3. *SEBASTES AURICULATUS*, Gir. Proc. Phil. Acad. Nat. Sci. 1854, and P. R. Rep. x. p. 80.

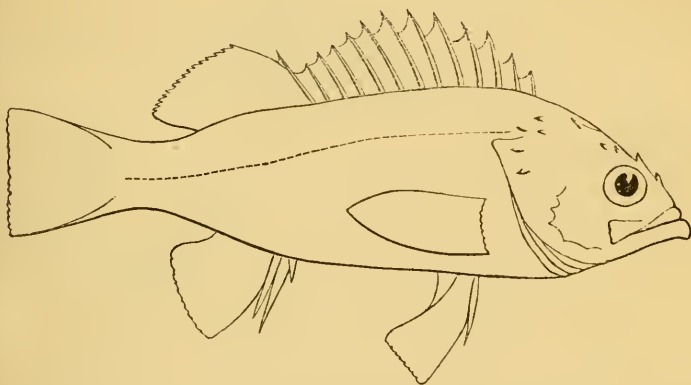
S. ruber, var. *parvus*, Ayres, Proc. Cal. Acad. Nat. Sci. 1854, i. p. 7.

Sebastichthys auriculatus, Gill, Proc. Phil. Acad. Nat. Sci. 1862, p. 278.

Sebastes auriculatus, Ayres, Proc. Cal. Acad. Nat. Sci. ii. p. 218, fig. 68.

All the spines of the top of the head regular, smooth, strongly marked, but not very prominent. Nasal stout and sharp; anterior

and posterior supraorbitals strong and sharp, but not so elevated as to make much depth to the intraorbital fossa; intraorbital ridges just discernible; postorbital spine slender, very sharp; occipital ridge smooth, somewhat prominent, not spined. Upper two preopercular spines sharp, next two flattened and serrated or edged, anterior one blunt. Humeral, scapular, and two opercular spines flat, not prominent; lower angle of operculum serrated. Spinous dorsal a little higher than the soft portion, or sometimes only equal. Second anal spine as high as the third, and stouter.



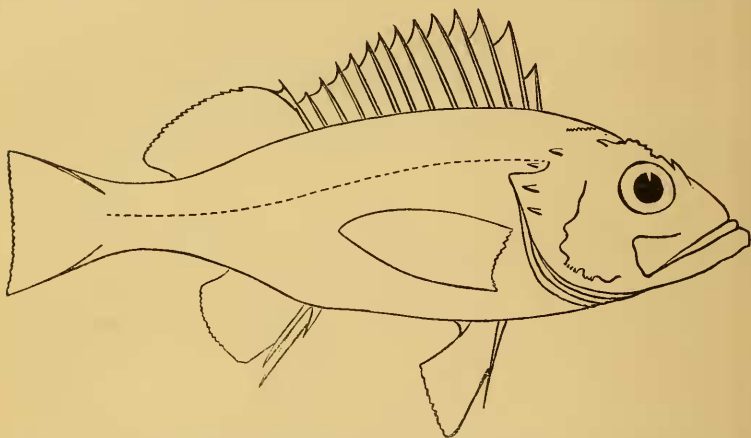
The colours are stated with sufficient accuracy by Girard (*loc. cit.*). *S. auriculatus* is perhaps the most common species we have, and is almost the only one taken about the wharves of the city. The examples for the most part small, seldom exceeding half to three-quarters of a pound in weight, though those brought in by the fishermen from the deep water are much larger; the heaviest I have seen was 20 inches long, with a weight of six pounds. In the large specimens the black spot of the operculum becomes almost obsolete.

The typical specimens of *S. nebulosus* and *S. auriculatus* are quite widely distinct; but so many intermediate forms occur, that not unfrequently it is actually very difficult to decide to which of the two certain individuals should be referred. The spines and ridges of the head I have found more reliable as means of diagnosis than any other features.

4. SEBASTES RUBER, Ayres, Proc. Cal. Acad. Nat. Sci. i. p. 7, and ii. p. 208, fig. 63 (non *S. rosaceus*, Gir. P. R. Rep. x. p. 78).

Top of the head quite rough, the ridges being thinner and more irregular on their edge than in the other species. Nasal spine sharp and rather strong; supraorbital crest consisting of an anterior spine which is distinct and regular, and then an elongated irregularly serrated ridge, not ending in any very distinct spine; postorbital spine not large, but quite sharp, distinct, and regular; intraorbital pair of

ridges low and not much crested, but quite discernible; occipital ridge long, about as high as in *S. nebulosus*, irregularly serrated, and not ending in any very distinct spine; the upper two preopercular spines rather sharp, the next two flattened and serrated on the end, the anterior one blunt; opercular spines flat; humeral and scapular small. Second and third anal spines about equal in height and size. Spinous dorsal higher than the soft portion. Posterior margin of the caudal nearly even. Colour nearly uniform light crimson, lighter beneath.



This is the species described by me in 1854 (*loc. cit.*), but is not the one to which the name is referred by Girard (P. R. Rep. x. p. 78) as a synonym of *S. rosaceus*. The two have little close resemblance, except in colour. The points of difference will be given when speaking of *Sebastodes rosaceus*.

S. ruber is not at all rare. It grows to decidedly a greater size than any of the other species, reaching occasionally a weight of twenty-five pounds, and, as the fishermen assert, even greater still, while those of from ten to twelve pounds are quite common.

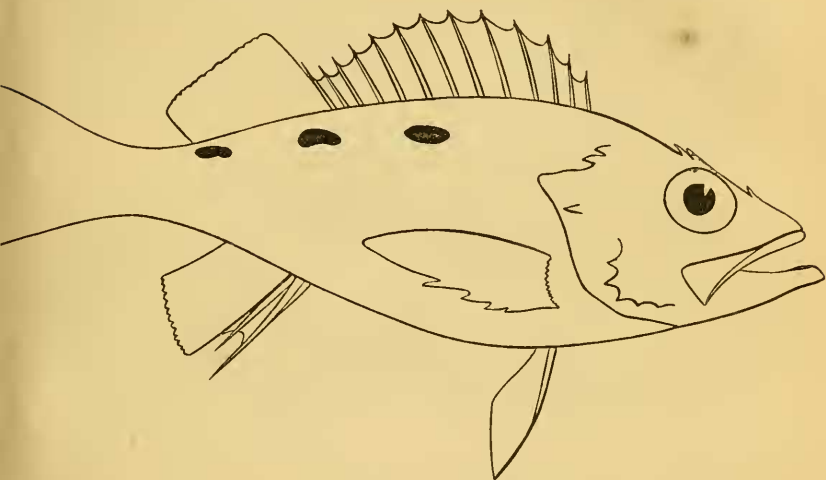
5. *SEBASTES HELVOMACULATUS*, Ayres, Proc. Cal. Acad. Nat. Sci. 1859, ii. p. 26, fig. 8.

S. ocellatus?, Cuv. (*fide* Gill, Proc. Phil. Acad. Nat. Sci. 1862, p. 278).

Sebastichthys ocellatus, Gill (*loc. cit.*).

Upper surface of the head quite strongly ridged. Nasal and anterior supraorbital spines sharp, quite prominent; posterior supraorbital forming a crest, which ends in commonly two prominent sharp spines; intraorbital fossa well marked, with two intraorbital ridges; postorbital spine appearing like a continuation of the posterior supraorbital, prominent, very sharp; occipital ridge somewhat

elevated, ending in a free spine; of the preopercular spines, the upper two are well developed, not very sharp, the lower three forming blunt projections; two opercular spines sharp, not very long. Humeral and scapular somewhat prominent. Spinous dorsal a little higher than the soft portion. Second anal spine higher than the third, and much stouter.



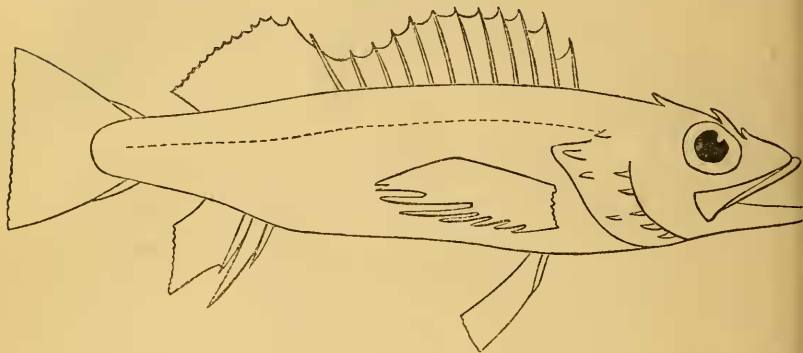
Colour pale red, becoming lighter beneath, with several light-pink spots on the upper parts of the sides. These spots are commonly three, though occasionally one or two additional irregular ones are seen. Sometimes in the largest specimens the light red of the ground-colour is variegated with numerous minute whitish specks.

The outline figure (given above) represents the projection of the lower jaw a little more strongly marked than it should be; and shows also but the lower of the two opercular spines, giving instead one too many on the præoperculum. Otherwise, though rough, it is tolerably characteristic.

S. helvomaculatus is not by any means rare, being brought to the markets of San Francisco in some numbers. They are commonly small, not exceeding a pound in weight, though specimens weighing three to four pounds are sometimes seen. This species has been referred by Mr. Gill (*loc. cit.*) to the South American form described by Cuvier, *S. ocellatus*. The identification may perhaps be correct, for the two doubtless approach each other closely; but the difference in proportions, in the spines of the head, and in the colouring of the fins, and the wide separation in localities, together with the fact that no specimens have been brought to me among numerous collections made on this coast south of Point Conception, have induced me to retain, at least for the present, the name given to our northern species.

6. *SEBASTES ELONGATUS*, Ayres, Proc. Cal. Acad. Nat. Sci. ii. p. 26, fig. 9.

Nasal spine sharp, quite prominent; anterior supraorbital well marked, sharp; posterior supraorbital forming a crest quite sufficient to leave an intraorbital fossa, and terminating in a sharp spine; postorbital just discernible; occipital ridge smooth, low, with a free point. Opercular, preopercular, humeral, and scapular spines prominent and sharp. Inferior angle of operculum and posterior angle of suboperculum spinous. Second anal spine higher and much stouter than the third. Spinous dorsal about equal in height with the soft portion.



S. elongatus is readily distinguished from all the other species of true *Sebastes* by its extreme slenderness, in which respect it closely resembles *Sebastodes paucispinis*, sometimes even surpassing it. The proportion of depth to length varies from about one-fifth to nearly one-fourth. The figure (given herewith) represents the first specimen found, which was as slender as any I have seen. In the figure a spine is inadvertently shown on the lower part of the operculum, while the scapular is omitted; the knobbed projection of the lower jaw is not sufficiently indicated. The colours are well stated in the original description.

The species appears to be not at all common, few being brought to the markets. They seldom exceed a pound in weight.

SEBASTODES.

In the species of this division no diagnostic characters can be drawn from the spines of the head, as so little difference is found in them. In all, the nasal, supraorbital, and occipital spines are barely discernible, or cannot be traced at all; the five preopercular are quite strongly developed, smooth, and sharp (except that in *S. paucispinis* the lower one is a blunt projection, with one, and sometimes two sharp points); the opercular two are long and sharp; the hu-

meral and scapular are almost concealed. The specific distinctions, therefore must be drawn from other features. The species may be arranged and defined as follows :—

1. SEBASTODES PAUCISPINIS.

Sebastes paucispinis, Ayres, Proc. Cal. Acad. Nat. Sci. i. p. 6 ; Gir. P. R. Rep. x. p. 83, pl. 22 A.

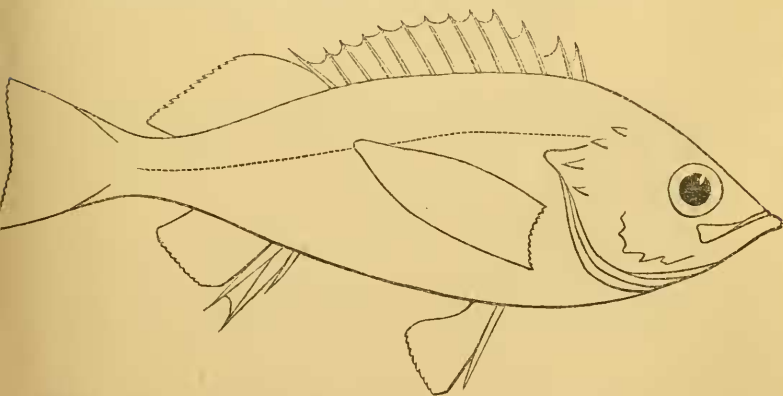
Sebastes paucispinis, Gill, Proc. Phil. Acad. Nat. Sci. 1861, p. 165.

This species is quite elongated in form, its depth being about one-fourth of its length. The spinous dorsal is arched in outline, the emargination between it and the soft portion being very distinct, though less strongly marked than in *S. flavidus* or *S. melanops*. The head is longer than in most species, constituting fully one-third of the entire length. But the feature by which *S. paucispinis* is at once recognized is the "small scales." They are relatively less than in any other known species, and are accompanied by a general softness of flesh, which causes the fish to be less esteemed for the table than any other of the group found in our waters. The description and figure given by Girard are tolerably accurate.

S. paucispinis is not by any means common in this vicinity. It is taken in company with the other species ; but no more than a single specimen at long intervals is seen in the markets. It attains a length of 25 to 28 inches.

2. SEBASTODES OVALIS, Ayres, Proc. Cal. Acad. Nat. Sci. ii. p. 209, fig. 65.

This species is much stouter than *S. paucispinis*, its depth being nearly one-third of its length. Its closest alliances are with *S.*



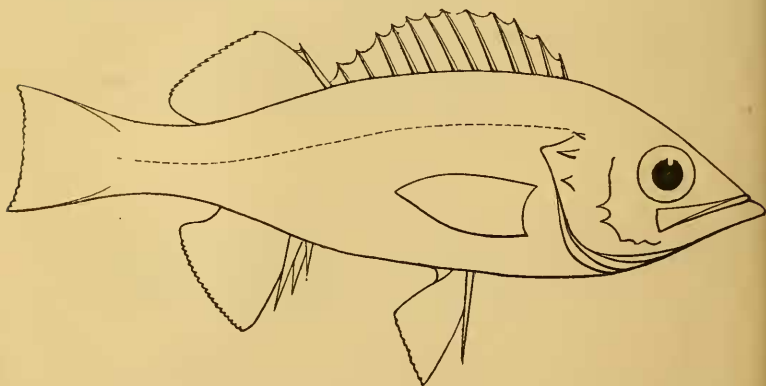
flavidus, Ayres, and *S. melanops*, Gir. The spinous dorsal decreases but little in height posteriorly, leaving of course but a slight emargination between it and the soft portion, which latter is low, its height

being less than half its length. The pectoral fins are large, their height being about one-fourth the length of the fish. Of the three spines of the anal fin, the second is the highest and stoutest, equalling the height of the soft portion of the fin. In colour the fish is of a dark greenish brown above, becoming yellowish green on the sides, and still lighter beneath. In regard to the softness of the scales it comes nearer than any other species to *S. paucispinis*, though they are relatively much larger than in the latter.

S. ovalis appears to be quite rare, only a few specimens having been seen. None have exceeded three pounds in weight.

3. *SEBASTODES FLAVIDUS*, Ayres, Proc. Cal. Acad. Nat. Sci. ii. p. 209, fig. 64.

This species is so closely allied to *S. melanops*, Gir., as scarcely to be distinguished from it, except by its colours. *S. melanops* is nearly black above, lighter on the sides and beneath; while *S. flavidus* is like *S. ovalis*, "dark greenish brown above, becoming yellowish green on the sides, and still lighter beneath."



S. flavidus is by no means uncommon, being brought to the markets in abundance. It seldom exceeds two pounds in weight.

4. *SEBASTODES MELANOPS*, Gir.

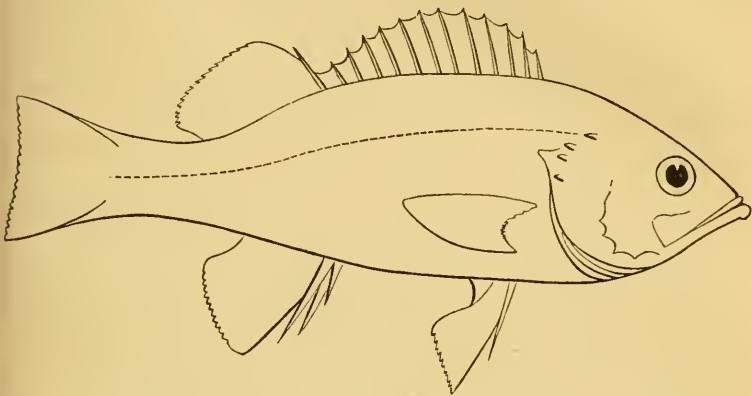
Sebastes melanops, Gir. Proc. Phil. Acad. Nat. Sci. viii. p. 135; and P. R. Rep. x. p. 81.

Sebastes variabilis, Ayres (non Cuvier), Proc. Cal. Acad. Nat. Sci. 1854, i. p. 7.

Sebastes melanops, Ayres, Proc. Cal. Acad. Nat. Sci. ii. p. 211, fig. 66.

This species is sufficiently well described by Girard (*loc. cit.*); but inasmuch as no figure is given by him, reference may be made to the outline illustration given herewith (p. 341), which is accurately reliable.

S. melanops is quite common here, and is brought to the markets in large numbers. It is generally small, not exceeding a pound in

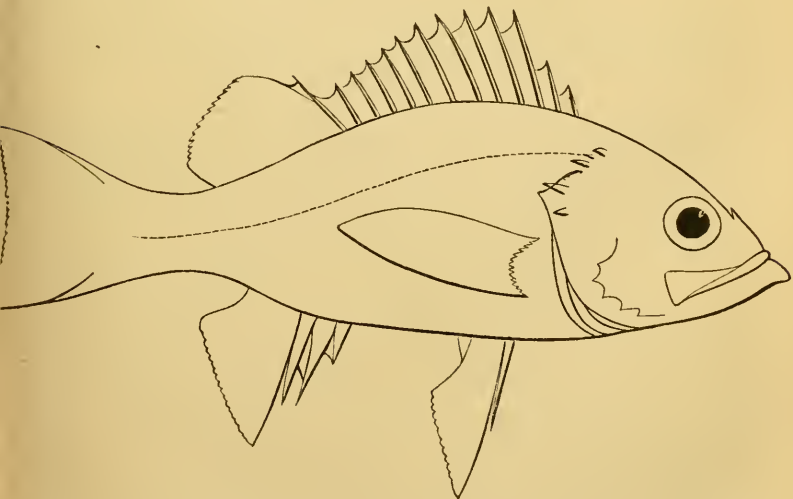


weight, though it occasionally attains a weight of three or four pounds.

5. *SEBASTODES ROSACEUS*, Gir.

Sebastes rosaceus, Gir. Proc. Phil. Acad. Nat. Sci. viii. p. 146 ; and P. R. Rep. x. p. 78, pl. 21 (non *Sebastes ruber*, Ayres, Proc. Cal. Acad. Nat. Sci. i. p. 7).

Sebastodes rosaceus, Ayres, Proc. Cal. Acad. Nat. Sci. ii. p. 206, fig. 62.



This is the species originally described by Girard (*loc. cit.*) under the name *rosaceus*, and again quite correctly in the tenth volume of the 'Pacific Railroad Reports.' In this latter publication he incorrectly refers my *Sebastes ruber* to it as a synonym. The two are widely distinct: *S. ruber* has the top of the head strongly ridged and spinous, as already stated in this present communication; *S. rosaceus*, as its generic affinities indicate, has the same region almost entirely smooth, the nasal and occipital spines being barely discernible: in *S. ruber* the preopercular spines are blunt, almost truncated; in *S. rosaceus* the same spines are long and very sharp: in *S. ruber* the anal fin is small and rounded, its height being only about one-eighth of the length of the fish, while the second and third spines of the fin are nearly as high as the soft portion; in *S. rosaceus* the same fin is much larger and pointed, its height being more than one-sixth of the length of the fish, while the third anal spine (which is higher than the second) is only about half as high as the soft portion. Many other points might be noticed, but these are sufficient. The outline figures show very clearly the relations of the two species.

Sebastes rosaceus is quite common. It is a smaller fish than *Sebastes ruber*, seldom exceeding five or six pounds in weight.

The eleven species thus indicated are brought to the markets of San Francisco at all times of the year, the fishery being little affected by the seasons. They are taken with the hook, in the open sea, near the Bay of San Francisco, wherever rocky bottom is found. One species only, *Sebastes auriculatus*, is caught about the wharves of the city. The spawning-season is from March to June; and in all the species the development of the young takes place within the body of the mother, but to what degree I have not yet the means of stating with absolute accuracy. I have traced them to such a stage of advancement that the mouth, the intestinal canal, the vertebral divisions, and the vertical fins were all plainly discernible, and of course the eyes strongly marked and prominent, the embryo on being removed from the egg being fully half an inch in length.

NOTES ON THE KAGU. BY DR. GEORGE BENNETT, F.Z.S.

On the 13th of June 1863, I received from New Caledonia, by H. I. M. Schooner 'La Calédonienne,' a pair of Kagus (*Rhinocetus jubatus*), male and female—one presented to me by Dr. Segol, the surgeon of the vessel, and the other obtained and sent to me by the kind exertions of M. Ferdinand Joubert, now residing in New Caledonia. Both these gentlemen have been indefatigable in endeavouring to procure living specimens, the value of which is much raised by the increased scarcity of Kagus on the island. The day following their arrival I placed them in the aviary in the Botanical Gardens. The female is a fine bird, and the largest specimen of the Kagu I have yet seen. It is graceful and elegant in appearance, active and lively in its habits, and its plumage in excellent condition. It is distinguishable from the male bird by its much larger size, and by the light colour of its plumage, also of its bill, feet, and legs. She has besides a peculiar habit of crouching on the ground and covering herself with her wings, by throwing them over together in a concave

form, completely concealing the head and body. The male bird, on the contrary, throws up his wings alternately, as if using them as shields, and displays much pugnacity. The latter differs in colour from the female, his plumage being dark brown, with bars of a lighter shade; the primaries and secondaries of the wings are very dark brown, barred with black; the crest is also of a much darker shade of grey than in the female; the bill and legs are of a bright orange-red colour. When seen together, the male appears small compared with the female. The latter utters a growling kind of scream; while the male makes a noise between a bark and a laugh, which is difficult to express in words, terminating in the oft-repeated note of *ōō*, *ōō*, *ōō*, *ōō*. The male bird is very lively, and readily attacks its aggressors.

The Kagu is becoming very scarce in New Caledonia,—one cause of its rarity being that numbers have been shot for the table, these birds being excellent eating. It is now difficult to procure them dead, and still more so to take them alive. They are only found in one part of the island, about ten miles distant from the settlement of Port de France, where a gentleman told me he offered a large reward to the natives to procure one to take with him to France, but without success. The birds sent to me had been in the possession of private individuals for some time. The Kagus are easily domesticated, and, when captured, are placed in the poultry-yard with the fowls, where they soon become tame; but, as a matter of precaution, one of their wings is usually clipped. These birds are only met with about small marshes or ponds, feeding on worms, slugs, &c. The nest and eggs have not yet been discovered, although every exertion has been and is still being made by some of my resident friends in New Caledonia for that purpose.

MISCELLANEOUS.

On Alternate Generation in the Annelida, and the Embryology of Autolytus cornutus. By A. AGASSIZ.

FROM the works of Oersted, Grube, J. Müller, Max Müller, and Keferstein, it appears that *Autolytus* presents the rare peculiarity among Annelides of a striking polymorphism, the males being indeed so different from the females that the two sexes have been described as belonging to distinct genera. There exists also in each species a third form, namely, the asexual form, which produces the sexual individuals by gemmation at its posterior extremity—the alternation of generations in these worms being now well established.

Mr. A. Agassiz has found in the harbour of Boston the *Autolytus* of which the males were described by Oersted, in 1843, under the name of *Polybostrichus setosus*, from Greenland. He has likewise observed, in the same locality, another species, to which he gives the name of *Autolytus cornutus*—a species which appears to be nearly related to the European *Autolytus* (*Sacconereis*) *Helgolandia*. The differences between the individuals of the two sexes are of the same nature as in the European species. The females, at the moment of their detachment from the organic individuals, possess no ovigerous